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9/27/05  
Date:

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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re patent application of:

Applicant(s): Bharath Rangarajan, *et al.*

Serial No: 10/000,208

Filing Date: October 23, 2001

Examiner: Yewebdar T. Tadesse

Art Unit: 1734

Title: RECIRCULATION AND REUSE OF DUMMY-DISPENSED RESIST

Mail Stop Appeal Brief-Patents  
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**REPLY BRIEF**

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Dear Sir:

Appellants' representative submits this Reply Brief in response to the Examiner's Answer dated July 27, 2005. A credit card payment form is filed concurrently herewith in connection with all fees due regarding this document and the Request for Oral Hearing. Appellant hereby respectfully requests to present arguments via telephone in accordance with MPEP §1209. In the event any additional fees may be due and/or are not covered by the credit card, the Commissioner is authorized to charge such fees to Deposit Account No. 50-1063 [AMDP481USA].

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REMARKS

Claims 1-6 and 8-13 are currently pending in the subject application and are presently under consideration. Favorable reconsideration of the subject patent application is respectfully requested in view of the comments herein.

**A. Rejection of Claims 1, 5, 6, 8, 9 and 11 - 13 Under 35 U.S.C. §103(a)**

Claims 1, 5, 6, 8, 9, and 11 - 13 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kitano *et al.* (U.S. Patent No. 6,371,667) in view of Tateyama *et al.* (U.S. Patent No. 5,965,200) and Ravishankar (U.S. 4,803,946). Withdrawal of this rejection is respectfully requested for at least the following reasons. Neither Kitano *et al.* nor Tateyama *et al.* nor Ravishankar, alone or in combination, teach or suggest every aspect set forth in the subject claims.

To reject claims in an application under §103, an examiner must establish a *prima facie* case of obviousness. A *prima facie* case of obviousness is established by a showing of three basic criteria. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. See MPEP §706.02(j). The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. See *In re Vaack*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Independent claim 1 recites, "a return line in fluid communication with the reservoir, the *return line has a liquid trap* to mitigate fluid evaporation; wherein the nozzle is moveable between first and second positions to continuously dispense liquid; in the first position, the nozzle is positioned to dispense liquid from the reservoir onto a substrate; and *in the second position the nozzle is positioned to dummy-dispense liquid from the reservoir into the return line* to provide a constant flow of liquid through the nozzle to mitigate residual occlusion accrual in the nozzle." Independent claim 13 sets forth similar aspects.

Regarding the finality of the Final Office Action dated December 7, 2004, and as stated

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in the Reply thereto, it is respectfully submitted that the finality of that Office Action was premature for at least the following reasons. The Examiner introduced a reference, Ravishankar (U.S. 4,803,946), to which appellants' representative cannot find any reference in any previous rejection of any claim in the application. The Examiner cited the new reference to address the claimed aspect of "a *liquid trap* to mitigate fluid evaporation" in a return line, which aspect was incorporated into independent claims 1 and 13 by amendment in the Reply to Office Action dated July 2, 2004. However, such aspect was previously set forth in dependent claim 7 (now cancelled) and thus could not have necessitated new grounds of rejection and/or further search pursuant to MPEP §706.07(a). Therefore, because such aspect was present when the Examiner conducted the original search and the new grounds for rejection was not necessitated by the previous amendment, Ravishankar should have been presented in the previous Office Action in order to afford appellants' representative an opportunity to traverse the rejection based thereon.

In the Advisory Action dated February 18, 2005, the Examiner contended that claim 7 previously recited a "trap" in the return line, and claim 1 was amended set forth a "*liquid trap*" in the return line, which necessitated a new search. Appellants' representative respectfully points out that the only trap described in the subject application is a *liquid trap*, which is consistent with the fact that the return line in which the trap is located returns *liquid* (e.g., resist) that is dispensed from the nozzle to a reservoir for immediate recycling. Thus, it is unclear to appellants' representative why the "trap" of claim 7 was not rejected under Ravishankar at an earlier stage in the prosecution of this application to permit appellants' representative the opportunity to traverse a rejection based thereon. In view of such, it has repeatedly been respectfully requested that the subject claims be allowed, or at a the finality of the previous Office Action be withdrawn and that a new non-final Office Action be issued.

In a second Advisory Action dated April 8, 2005, the Examiner stated that the "trap" previously set forth in claim 7 (now cancelled) "is considered to be a generic term that includes both liquid traps and non-liquid traps, such as filters. Although the specification describes a liquid trap in the return line, the return line includes a filter, which is a non-liquid trap." However, "trap" and "filter" are clearly delineated in the subject specification, such that "trap is not a generic term that includes "filters." For example, "Return line 140 can also include a *liquid trap to reduce evaporation of solvent and reduce the extent to which resist solution contacts air*. The trap is filled with resist solution. When a trap is used, it is advantageously located near the entrance of return line 140, whereby a large portion of return line 140's volume is isolated from

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the outside air.” (Page 11, lines 14-18). However, “Return line 140 is provided with a filter 144. This filter is intended to remove contaminants and/or dried resist that may have gotten into the system.” (Page 11, lines 20-21.) Thus, “filter” and “trap” are neither generic terms nor interchangeable as suggested by the Examiner, but rather are distinct components that can be introduced into the return line 140 to provide distinct and unique respective advantages (*e.g.*, removing contaminants and preventing evaporation, respectively), as set forth in two contiguous paragraphs of the specification at page 11. Additionally, the specification is the single best source for claim construction (see generally, *Phillips v. AWH Corp.*, No. 03-1269, 75 USPQ2d 1321 (Fed. Cir. 7/12/05), (70 PTCJ 309 7/15/05)). Thus, any construction that relies on the interchangeability of the terms “trap” and “filter” is unacceptable where the specification clearly delineates the two terms as being different and/or serving different purposes (*e.g.*, mitigating evaporation and removing contaminants, respectively).

Regarding the subject rejections, the Examiner contends that “the features upon which appellant relies (*i.e.*, direct dispensing of resist liquid into the return line) are not recited in the rejected claims.” However, the subject claims specifically and clearly recite dummy-dispensing liquid from the reservoir into the return line to recycle resist material directly to the resist reservoir when resist material is not being applied to a substrate, without requiring a catch member. In this manner, resist material can continuously flow through a nozzle *and* can be recycled when not directed onto the substrate in order to mitigate waste of the resist material and nozzle occlusion due to fast-drying resist material(s). Neither Kitano *et al.* nor Tateyama *et al.*, alone or in combination, teach or suggest such features of appellants’ claimed invention.

Kitano *et al.* relates to a filming method and a film forming apparatus for decreasing the amount of processing solution utilized, thereby eliminating waste and forming a uniform processing solution film on a substrate. Kitano *et al.* discloses a catch member to catch resist solution discharged from a resist solution nozzle. However, the catch member as disclosed in Kitano *et al.* is *not in fluid communication* with any storage means to contain the discharged resist solution. This implies that Kitano *et al.*’s catch member is merely a prophylactic device to prevent discharge of resist solution while the resist solution nozzle is located and centered above the substrate. The recycling of the resist solution in Kitano *et al.* therefore is neither contemplated nor put at a premium. Additionally, Kitano *et al.* goes so far as to discuss the *undesirability* of continuous resist flow. For example, “...when the diameter [of the nozzle] is more than 500  $\mu\text{m}$ , the resist solution drips from the resist solution discharge nozzle, which

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*makes control of the flow rate impossible.*" (Column 6, lines 2-5.) Thus, Kitano *et al.* discusses the importance of limiting the nozzle diameter depending on the viscosity of the particular resist being dispensed *in order to avoid continuous flow*. In this sense, Kitano *et al.* actually teaches away from continuous resist flow. A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984).

It is readily apparent that the catch mechanism disclosed in Kitano *et al.*, is not intended to address (nor contemplates or suggests) the issue of capturing dummy-dispensed resist and subsequently returning the aforementioned dummy-dispensed resist to a storage means in order to *prevent the resist from drying and forming residues on the dispense head*, which would in consequence *occlude the dispense head orifices*, and which would in turn affect the *amount and pattern by which resist is subsequently dispensed from the dispense head* in the future.

The Examiner relies on Tateyama *et al.* to introduce the aspect of recycling of a surplus coating solution. The Examiner states that Tateyama *et al.* is included to introduce the aspect of recycling of surplus fluid and is not intended to disclose using fast drying resist solutions. However, Tateyama *et al.* utilizes a *suction* nozzle connected to a liquid recycle processing mechanism to recover liquid used during processing. Thus, the methods elucidated by Tateyama *et al.*, viz., air ejected from a compressed air source to provide a vacuum, *vacuum pumps*, and a motor and an *aspirator* (See Tateyama *et al.*, column 5, lines 55-64), would have a considerable deleterious effect on *fast drying resist* solutions contemplated in the subject invention. Accordingly, the introduction of the recycling system of Tateyama *et al.* to the fast-drying resist dispensing system of Kitano *et al.* would not result in appellants' invention as set forth in independent claims 1 and 13. Indeed, the introduction of the aspect of a vacuum pump that uses air to draw up excess fluid to a system that employs a fast-drying resist does not teach or suggest the claimed aspect of a return line that uses gravity and a fluid trap to return continuously dispensed fast-drying resist to a reservoir in order to prevent residual occlusion accrual, the very essence of which is to avoid excessive contact with air. Moreover, such a combination would be inoperable to mitigate resist evaporation/residue, as it would by nature *increase* evaporation of surplus resist.

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It is essential to consider all elements of the claimed invention; it is impermissible to compare the prior art with what the viewer interprets the "gist" of the invention to be *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 19 USPQ2d 1111 (Fed. Cir. 1991); *Perkin-Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 221 USPQ 669 (Fed. Cir. 1984); *Jones v. Hardy*, 727 F.2d 1524, 1527-28, 220 USPQ 1021m 1024 (Fed. Cir. 1984).

Tateyama *et al.*'s approach, rather than aiding in the collection of fast drying resists, *would instead hinder such collection and recirculation by expediting the evaporation of the volatile solvent base from the fast drying resist.* The Examiner's contention that Tateyama *et al.* is not cited to introduce the aspect of using a fast-drying resist is irrelevant because the Examiner is attempting to combine the vacuum pump of Tateyama *et al.* with the fast-drying resist dispensing system of Kitano *et al.*: thus, the only fluid present in the Examiner's proposed combination for the vacuum to collect is a fast drying-resist. By accelerating the evaporation of the volatile solvent base from the resist through the introduction of compressed air sources, vacuum pumps, or motors and aspirators, *Tateyama et al. would expedite the formation and accretion of resist residues on the dispense head*, compounding the occlusion of dispense head orifices by accelerating the dissipation and depletion of the vaporized solvent base atmosphere. Clearly Tateyama *et al.*'s technology is not adapted towards collection and recirculation of surplus resist suspended within extremely volatile solvent bases. The subject claimed invention on the other hand, adopts measures to minimize dissipation and depletion of the volatile solvent base atmosphere, crucially, the subject invention attempts to negate, or at the very least, ameliorate formation and accretion of resist residues on the dispense head and the consequent occlusion of dispense head orifices. Therefore, it is readily apparent that Tateyama *et al.*, although discussing a fluid recycling system, cannot be combined to provide a recycling element for use with the resist fluid described in conjunction with appellants' claimed invention.

Thus, neither Kitano *et al.* nor Tateyama *et al.*, alone or in combination, teach or suggest the appellants' claimed invention. Further, given that Kitano *et al.* is concerned with the minimization of wastage with regards to a processing solution and the forming of a uniform processing solution film on a substrate, but yet, does not disclose a facility to recycle any surplus processing solution that might be generated, and moreover, that Tateyama *et al.* provides a processing method and processing apparatus to recover a processing liquid used to process an object, but discloses a recovery method that is highly impractical with respect to fast drying

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resists suspended in volatile solvent bases, it is respectfully submitted that there could have been no motivation to impel one ordinarily skilled in the art to combine Kitano *et al.* together with Tateyama *et al.*, to do what the appellants have done.

Ravishankar fails to overcome the deficiencies of Kitano *et al.* and Tateyama *et al.* with respect to independent claims 1 and 13. The Examiner has introduced Ravishankar to add the aspect of a fluid trap in a return line, which aspect was previously set forth in dependent claim 7 and is now recited in independent claim 1. However, Ravishankar, cannot overcome the inoperability of the proposed combination of Kitano *et al.* and Tateyama *et al.* Moreover, and as stated above, the introduction of Ravishankar in response to an amendment that did not introduce new subject matter to the claims and did not require further search by the Examiner makes the finality of the Final Office Action dated December 7, 2004 premature.

It appears that the Examiner originally rejected claim 7 under the assertion that Tateyama *et al.* teaches a trap that catches impurities in a fluid. *See e.g.*, Office Action dated July 2, 2004, page 3. However, as stated in the Reply to that Office Action, Tateyama *et al.* does not teach or suggest a trap, but rather a filter. The subject application specifically delineates between a trap and a filter. *See e.g.*, Page 11, lines 14-23. Thus the trap previously claimed in claim 7 and now set forth in the subject independent claims 1 and 13 is not taught by Tateyama *et al.*, which argument the Examiner has found persuasive as indicated by the Examiner's introduction of Ravishankar. However, upon the Examiner's determination that the assertion that Tateyama *et al.* teaches the trap set forth in the subject claims was inaccurate, and that Tateyama *et al.* in fact does not teach or suggest a trap in a return line, the subsequent Office Action introducing a new reference responsive to persuasive arguments made in the Reply to Office action dated July 2, 2004, should have been non-final. The fact that the claims set forth a *liquid* trap does not suffice to permit the Examiner to claim that new search was required due to the amendment when every aspect of the subject claims is related to liquid/fluid transportation and storage while mitigating evaporation. Thus, a trap in a return line that transports a resist fluid is necessarily a liquid trap, as repeatedly detailed in the subject specification.

The prior art items themselves must suggest the desirability and thus the obviousness of making the combination without the slightest recourse to the teachings of the patent or application. Without such independent suggestion, the prior art is to be considered merely to be inviting unguided and speculative

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experimentation which is not the standard with which obviousness is determined. *Amgen, Inc. v. Chugai Pharmaceutical Co. Ltd.*, 927 F.2d 1200, 18 USPQ2d 1016 (Fed. Cir. 1991); *In re Laskowski*, 871 F.2d 115, 117, 10 USPQ2d 1397, 1398 (Fed. Cir. 1989); *In re Dow Chemical Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1532 (Fed. Cir. 1988); *Hodosh v. Black Drug*, 786 F.2d at 1143 n.5., 229 USPQ at 187 n.4.; *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1985).

Appellants' representative submits that there is no motivation to combine a fast-drying resist dispensing system with a vacuum pump. It is, furthermore, respectfully submitted that a suggestion otherwise would merely be an endeavor to utilize the appellants' specification as a 20/20 hindsight-based roadmap to achieve the purported combination.

In view of at least the foregoing, it is respectfully submitted that neither Kitano *et al.* nor Tateyama *et al.* nor Ravishankar, alone or in combination, teach or suggest appellants' invention as recited in independent claims 1 and 13 (and claims 5, 6, 8, 9, 11, and 12, which depend there from). Accordingly, it is respectfully requested that this rejection be withdrawn.

**B. Rejection of Claims 2, 3, and 10 Under 35 U.S.C. §103(a)**

Claim 2, 3 and 10 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kitano *et al.*, Tateyama *et al.*, and Ravishankar as applied in claim 1 in view of Akimoto *et al.* (U.S. Patent No. 5,938,847). It is respectfully requested that this rejection be withdrawn for at least the following reasons. Neither Kitano *et al.*, Tateyama *et al.*, Ravishankar, nor Akimoto *et al.*, alone or in combination, teach or suggest the subject invention, let alone there being no motivation to combine the references as suggested other than *via* employment of appellants' specification as a 20/20 hindsight-based roadmap to achieve the purported combination.

As discussed *supra* with respect to independent claims 1 and 13, neither Kitano *et al.*, Tateyama *et al.*, nor Ravishankar, alone or in combination make obvious appellants' invention. Claims 2, 3, and 10 depend from claim 1. Akimoto *et al.* does not make up for the aforementioned deficiencies of Kitano *et al.*, Tateyama *et al.*, and Ravishankar. Specifically, Akimoto *et al.* does not teach or suggest each and every element set forth in independent claim 1.

Moreover, and with specific regard to claim 10, the Examiner contends that Akimoto *et al.* teaches the aspect of capping a return line while resist is not being dispensed thereto, as set forth in dependent claim 10. To the contrary, the Examiner's cited section states that "In order to



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maintain the resist receptacle 51 clean enough for more accurate counting of particles, *the open top of the receptacle* 51 may be kept closed to all time, but *when the resist liquid is supplied into the receptacle* 51 in the predetermined amount. For the same purpose, a cleaning unit may be connected to the receptacle 51, for applying a solvent into the receptacle 51 to remove the residual resist liquid there from. Furthermore, a pump may be provided on the drain pipe 53 to drain the resist liquid and the solvent from the probe 51a." (Column 10, lines 45-54.) Thus, Akimoto *et al.* merely discusses closing a reservoir to prevent contamination of resist therein except when the reservoir is being filled (e.g., *not replenished via recycling through a return tube*), but does not teach or suggest *capping a return tube for returning recycled fast-drying resist to a when the nozzle is positioned to dispense resist onto a wafer*. Likewise, Kitano *et al.*, Tateyama *et al.*, and Ravishankar are silent regarding this aspect appellants' claimed invention. The constant-suction recycling method of Tateyama *et al.* *could not function with a capped return line or reservoir*, as the vacuum could not operate during a period in which a reservoir into which the recaptured fluid is intended for deposit were capped. Thus, none of the cited references teaches or suggests a *return line that is uncapped only when receiving resist fluid from a dispensing nozzle*.

In view of at least the above, this rejection should be withdrawn.

**C. Rejection of Claim 4 Under 35 U.S.C. §103(a)**

Claim 4 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Kitano *et al.*, Tateyama *et al.*, and Ravishankar as applied in claim 1, in view of Tholome (U.S. Patent No. 4,785,760). It is respectfully submitted that this rejection should be withdrawn for at least the following reasons. As discussed above, neither Kitano *et al.*, Tateyama *et al.*, nor Ravishankar, alone or in combination, teach or suggest appellants' invention as set forth in claim 1. Tholome is insufficient to overcome the deficiencies in obviousness, not to mention operability, enunciated above in connection with the combination of Kitano *et al.*, Tateyama *et al.*, and Ravishankar.

In view of the foregoing, it is respectfully requested that this rejection be withdrawn.

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CONCLUSION

The present application is believed to be in condition for allowance in view of the above comments. A prompt action to such end is earnestly solicited.

Should the Examiner believe a telephone interview would be helpful to expedite favorable prosecution, the Examiner is invited to contact appellants' undersigned representative at the telephone number below.

Respectfully submitted,

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